

[54] **TRANSMITTER-OPERATED
FUEL-DISPENSING SYSTEM**

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222/36, 235/92 FL

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[58] Field of Search **222/2, 36-38, 153,**
222/14-20, 22; 235/92 PE, 92 FL, 61.8 A;
194/5, 13

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[57] **ABSTRACT**

A gasoline-dispensing system includes a portable transmitting unit for each service attendant and a plurality of transmitter-operated dispensing units. Each transmitting unit is connectable to any one of the dispensing units and has manually operable switching means cooperating with the interconnected dispensing unit for generating credit signals which are accepted and registered in the dispensing unit. A meter in each transmitting unit accumulates and indicates a running total of the number of accepted credits attributable to that transmitting unit. After the desired number of credits are accepted in the dispensing unit, the transmitting unit is removable to be used elsewhere while a customer serves himself. Each dispensing unit includes valves and means for closing them when the value of gasoline dispensed equals the number of credits accepted. A coin-return mechanism is provided for returning change to the customer as necessary.

4 Claims, 3 Drawing Figures

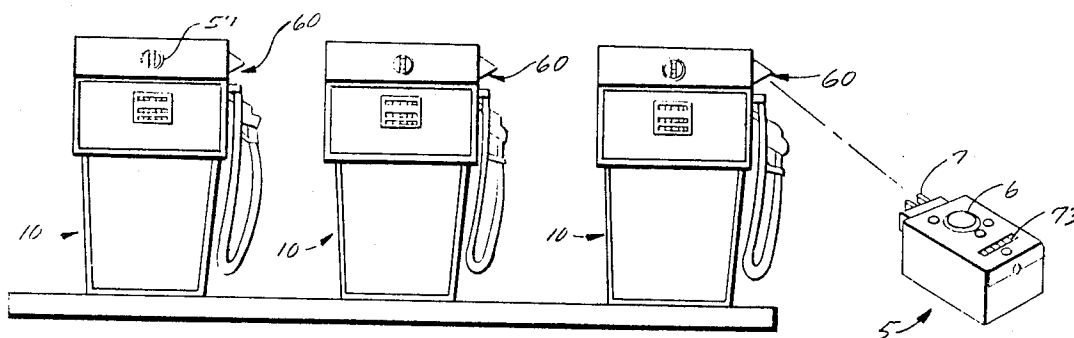


FIG. 1

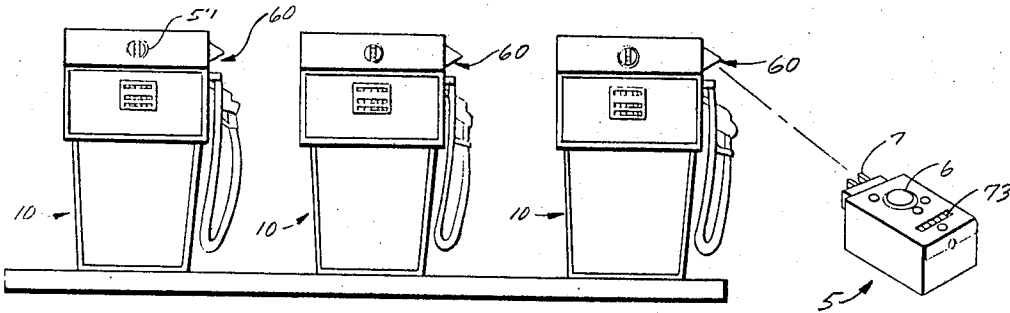


FIG. 2

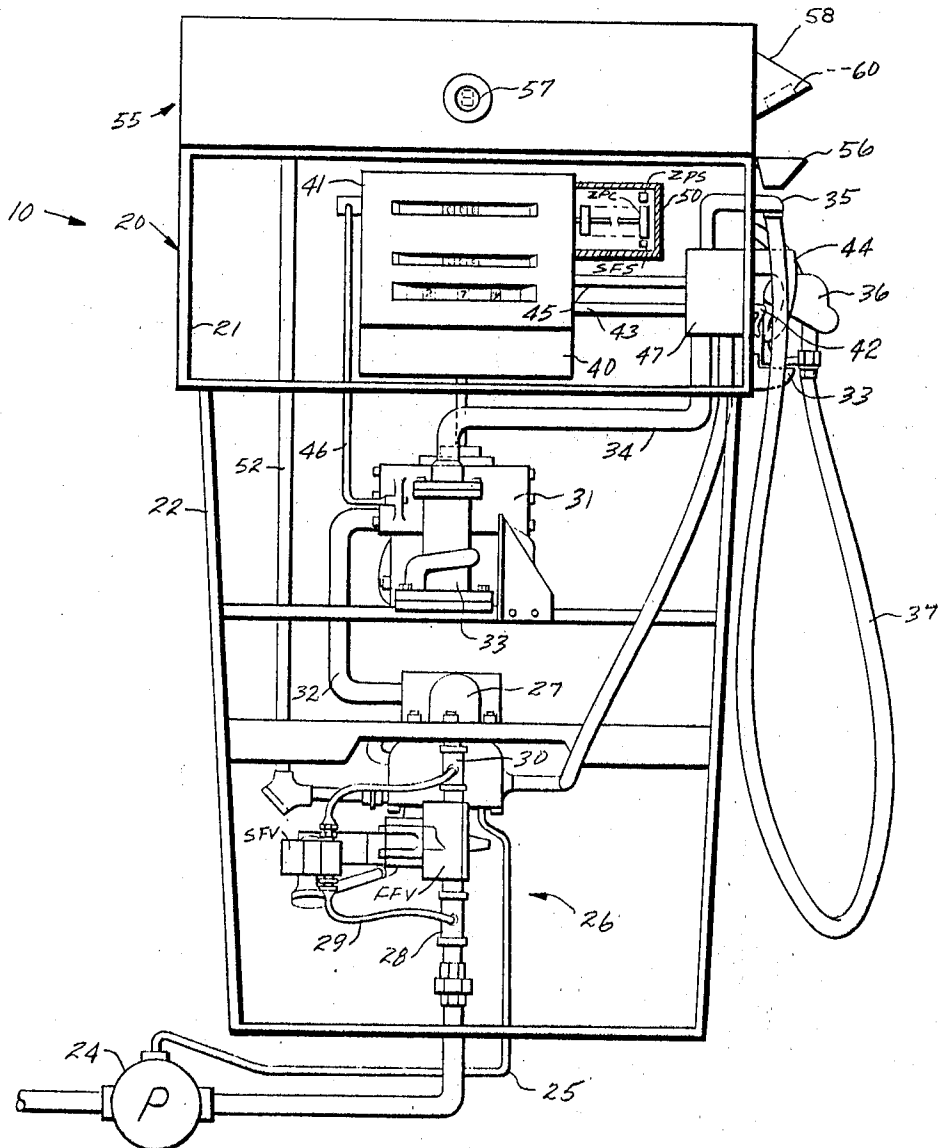
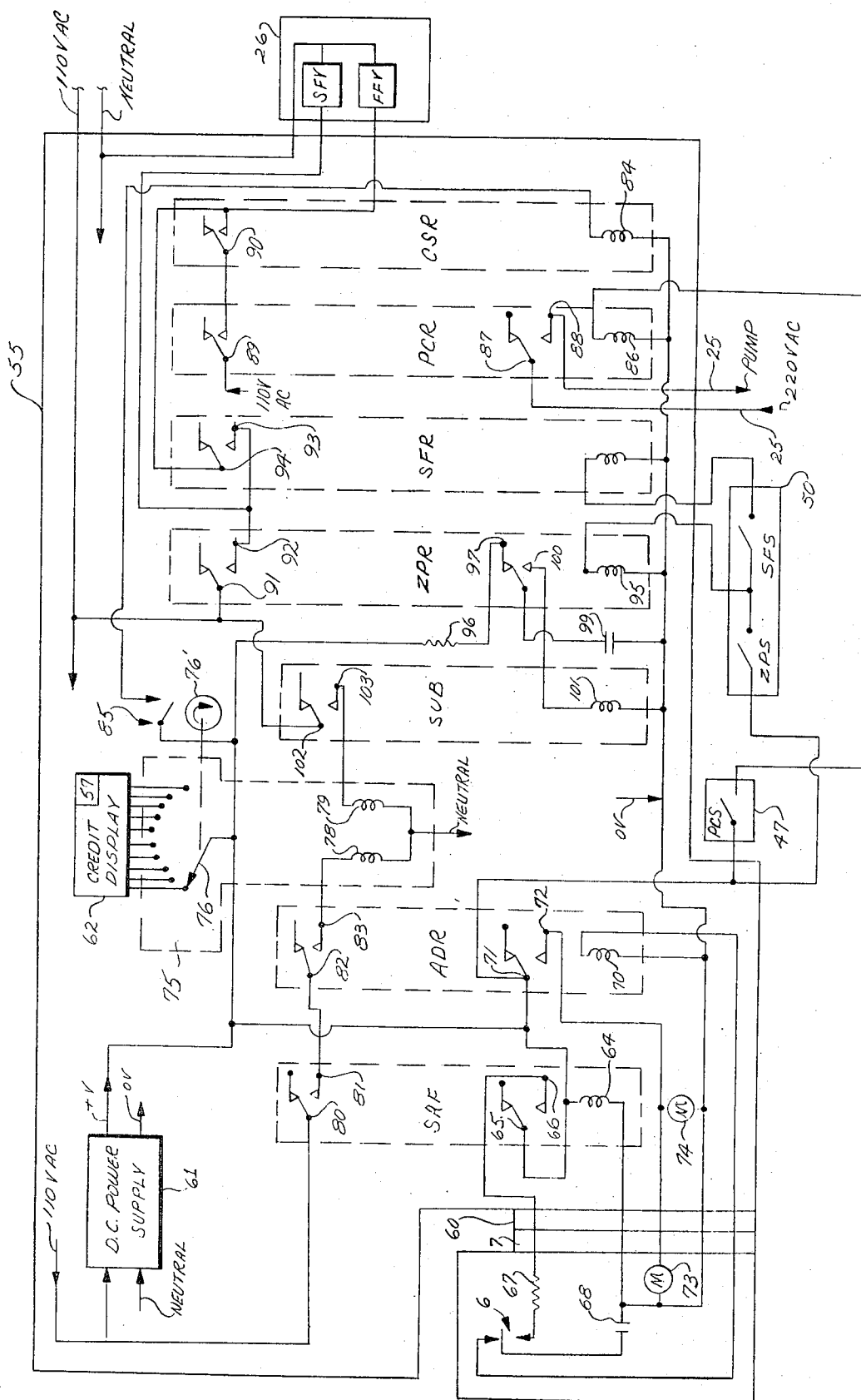


FIG. 3



TRANSMITTER-OPERATED FUEL-DISPENSING SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to fuel-dispensing systems and, in particular, to a gasoline-dispensing system for use at an automobile service-station.

2. Description of the Prior Art

In order to achieve low-overhead operation, various types of coin-operated gasoline dispensing systems have been used in the past which are adapted for self-service by each customer. Such prior art systems include coin-acceptance mechanisms which accept minted coins or tokens or, in some cases, both minted coins and tokens. Various problems arise in the operation of these prior art systems. Generally, incoming customers do not bring with them a sufficient number of coins to buy the amount of gasoline they desire. Therefore it is necessary for one or more attendants to keep a cache of coins or tokens to be exchanged with the customers for dollar bills. These coin exchange transactions increase overhead in the operation of the system and the cache of coins is a lure to robbers. Another problem of these prior art systems relates to unauthorized use of the system. Since anyone with coins can have access to the system, there is the hazard that children will serve themselves while a dispensing unit is unattended. Consequently many communities are opposed to the construction of such coin-operated gasoline-dispensing systems. Furthermore, the coin-acceptance mechanisms involve relatively complex mechanical arrangements which are costly not only to provide but also to maintain and repair when they become jammed, etc.

SUMMARY OF THE INVENTION

The present invention is directed to a fuel-dispensing system which substantially achieves the objective of low operating overhead through partial self-service without the disadvantages that accompany coin-operated systems.

The apparatus of this invention includes a portable transmitting unit, a transmitter-operated dispensing unit, and means for removably interconnecting them. In a more productive, larger system there are a plurality of substantially identical transmitter-operated dispensing units and each service station attendant carries his own portable transmitting unit to initiate the dispensing operation of any one of the transmitter-operated dispensing units. An electric circuit path is completed between a transmitting unit and a transmitter operated dispensing unit when they are interconnected. Means is provided including the electric circuit path for generating credit signals representative of a prepaid value of fluid to be dispensed. Each transmitter-operated dispensing unit further includes a fluid-flow meter, controllable means for dispensing fluid pumped through the fluid-flow meter, and means for controlling the controllable means so that the monetary value of the fluid dispensed does not substantially exceed the prepaid value represented by the credit signals.

In its preferred form, each portable transmitting unit comprises a hand-holdable container having a multi-pin electrical connector projecting therefrom, a push-button switch and an accumulating indicating meter

which are mounted in the container and exposed for operation and view by windows in the container and which are electrically connected to the connector. A pair of pins on the electrical connector are electrically interconnected to form a portion of the electric circuit path which is completed when the electrical connector is inserted into a mating electrical receptacle in a dispensing unit. After the transmitting unit and the dispensing unit are interconnected, the push-button switch receives a voltage from the dispensing unit which is switched by the push-button switch back into dispensing unit and the credit signal is produced in response thereto. The indication provided by the meter is simultaneously incremented with each such credit signal so that a running total of the credits attributable to that transmitting unit is accumulated for accounting purposes. After the desired number of credit signals have been generated, the attendant may remove the transmitting unit, initiate the actual dispensing of fluid and then allow the customer to serve himself in completing the dispensing operation. In this regard, preferably each dispensing unit includes a coin storage and a coin-return mechanism operable to return any change due the customer in the event the dispensing of fluid terminates for some reason before the value of the fluid dispensed equals the prepaid credit. This coin-return feature makes it unnecessary for an attendant to render any further service to the customer after initiation of the dispensing operation.

In terms of method the present invention is in a system comprising a plurality of independently operable dispensing units and at least one portable unit. A connection is first made between a connector part of a portable unit and a connector part associated with a selected dispensing unit. After this connection is made, a counter in the selected dispensing unit is incremented a desired number of times. Next, this connection is broken and as a result further incrementation of that counter is disabled. Next, the actual dispensing operation of the dispensing unit is initiated and the portable unit is carried to another dispensing unit where the process is repeated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a service station island with a plurality of transmitter-operated dispensing units and showing a transmitter unit in accordance with the present invention;

FIG. 2 is an elevation view of one of the gasoline-dispensing units of FIG. 1 with cover panels removed to show interior parts; and

FIG. 3 is a schematic diagram showing circuit components provided by this invention in a transmitter unit and in a transmitter-operated dispensing unit and their electrical interconnections.

DETAILED DESCRIPTION

A hand-holdable and portable transmitter unit 5 is shown in perspective in FIG. 1 along with a plurality of transmitter-operated gasoline dispensing units 10. A push-button switch 6 and an accumulating meter 73 are mounted in the transmitter unit and are electrically connected to pins on an electrical connector 7 projecting from the transmitter unit. The meter 73 is a conventional numerical counting mechanism comprising a plurality of rotatable wheels each having the ten decimal digits imprinted on its periphery and is responsive

to electrical actuation to rotate the wheels in a step-by-step fashion to provide a multi-digit display of the number of times it has been so actuated.

When a customer arrives to purchase gasoline he is met by a service attendant who carries a transmitter unit for which that attendant is personally responsible. The customer pays the attendant for the amount of gasoline desired. A conventional cash drop box (not shown) is provided at the service station where the cash receipts are kept securely. The attendant connects his transmitting unit to an available one of the dispensing units 10 to initiate the dispensing operation. The dispensing units 10 cannot be operated in any given sales transaction unless the transmitter is initially connected thereto to close a safety circuit path described in detail hereinafter.

After the transmitter unit is connected to a mating receptacle 60 in a dispensing unit, the attendant depresses and releases the push-button. Each time the push-button is so operated the customer is given a one dollar credit. A display light 57 on the dispensing unit displays the number of credits due the customer. Additionally, each time the push button is so operated with the transmitter and the dispensing unit interconnected, the meter 73 in that transmitter is incremented by one to indicate that the attendant is personally accountable for another one dollar receipt. A separate meter 74 (FIG. 3) in that dispensing unit is also incremented by one to provide a running total of the number of credits accepted by that dispensing unit. The provision of the meters simplifies the bookkeeping process. At the end of any work shift the meters show the number of credits and the corresponding cash receipts for which each attendant is personally responsible and also show the number of credits which have been accepted by each individual dispensing unit. This greatly simplifies the bookkeeping process and thereby eliminates much of the clerical work to be performed and many of the clerical errors usually involved in conventional systems. In this regard, it should also be noted that since no tokens are required in the operation of the system, there is no need to spend time counting and rebagging tokens. Thus labor costs are further minimized in the system according to this invention.

After the attendant inserts the appropriate number of credits, he removes the transmitter unit from the dispensing unit and initiates the actual dispensing of gasoline. Thereafter the attendant allows the customer to serve himself in completing the actual dispensing. Each dispensing unit is provided with coin-return mechanisms which are operative to return change to the customer. Thus if the customer's gas tank fills before he has received his prepaid amount of gasoline, he is automatically given change.

FIG. 2 shows in more detail one of the transmitter-operated units 10 which includes a conventional gasoline-dispensing unit indicated generally at 20. The dispensing unit 20 illustrated in FIG. 2 is sold by The Product Services Division of the A. O. Smith Co. under the designation Model L-501.

The dispensing unit 20 is housed by top cabinet 21, a supporting frame 22 and cover panels which have been deleted in FIG. 2 to show interior parts.

An inlet pipe 23 carries gasoline pumped to the dispensing unit 20 by a conventional electrically controlled gasoline pump 24 which is electrically connected to the dispensing unit 20 by a cord 25.

A valve assembly indicated generally at 26 is specially added to the above identified Model L-501 and connects the inlet pipe 23 to a strainer assembly 27. The valve assembly 26 includes a solenoid-operated fast flow valve (FFV) and a solenoid-operated slow flow valve (SFV) which control the flow of gasoline between the inlet pipe 23 and the strainer assembly 27.

When both the FFV and SFV valves are closed, no gasoline can flow up to the strainer assembly 27. When both the FFV and SFV valves are open, gasoline can flow to the strainer assembly 27 at approximately 40 times the rate at which it can flow when the FFV valve is closed and the SFV valve is open.

When gasoline is being dispensed with both the FFV valves and the SFV valves open, gasoline flows up from the inlet pipe 23 into a conventional T connector 28. The major portion of the gasoline then flows upward through the T connector to the FFV valve. A smaller portion of the gasoline flows outward through the T connector 28 and through tubing 29 to the SFV valve. Another T connector 30 has one side connected to receive gasoline from both the FFV valve and the SFV valve and a second side connected to supply gasoline to the strainer assembly 27.

A flow meter 31 is connected to the strainer assembly 27 by a tube 32. A control valve 33 associated with the flow meter 31 controls the flow of gasoline through the flow meter 31 and is connected by a tube 34 up to a hose coupling 35 mounted on the side of the top cabinet 21.

A hand operated nozzle 36 is connected to the hose coupling 35 through a hose 37. FIG. 2 shows the nozzle in its stored position wherein it is supported by a hook 38.

The flow meter 31 has extending vertically therefrom an output shaft 39 which rotates in proportion to the amount of gasoline dispensed. A computer unit 40 is responsive to the rotation of the output shaft 39 to compute the monetary value of the gasoline dispensed. A computer display unit 41 provides a visual indication of this computed monetary value, the per-gallon sales price, and the number of gallons dispensed on a given sale.

A reset lever 42 is secured to a shaft 43 extending horizontally from the computer display unit 41 through a hole in the top cabinet. Before any gasoline is dispensed in any given sales operation the reset lever 42 is manually rotated so as to reset the computer display unit. A control handle 44 is secured to a shaft 45 also extending horizontally from the computer display unit 40 through a hole in the top cabinet. The control valve 33 associated with the flow meter 31 is opened by a vertically extending linkage 46 operated by the computer display unit 41 in response to rotation of the shaft 45.

A switch box 47 in the top cabinet 21 houses a conventional microswitch, designated in the schematic of FIG. 3 as PCS, and which is closed in response to rotation of the control handle 44.

A special box 50 is added to the Model L-501 in the top cabinet 21. In accordance with the present invention box 50 houses a plurality of registering cams including a zero position cam ZPC. The registering cams are driven by a rotatable shaft provided as a standard feature in the computer display unit. In the example described, this shaft rotates one complete revolution for each ten cents worth of gasoline dispensed. Owing to

a gearing arrangement not specifically shown, the zero position cam rotates one complete revolution for each one dollar's worth of gasoline dispensed. The zero position cam has three angular reference positions called the zero position, the subtract position, and the slow-flow position respectively. A microswitch ZPS operated by the zero position cam is open when the zero position cam is at the zero position, closes when the zero position cam rotates to the subtract position, and opens again when the zero position cam rotates back to the zero position. In the example described, the switch ZPS is open for approximately 10° of rotation which corresponds to roughly 3 cents worth of gasoline. A microswitch SFS also operated by the zero position cam is open when the zero position cam is at the zero position, closes when the zero position cam rotates to the slow-flow position, and opens again when the zero position cam rotates back to the zero position.

The cams in the box 50 and other switches associated therewith also provide registration of the monetary value of the gasoline dispensed in a convenient form for use in coin-return operations.

A head box 55 is mounted atop the conventional fluid dispensing unit 20. A tray 56 projects outwardly from the bottom of the head box 55 for catching coins returned from a coin storage by conventional coin-return mechanisms such as apparatus disclosed in U.S. Pat. No. 2,754,950 contained therein. The head box 50 also contains a number of components such as relays, stepping switches and the like. One of these components, a stepping switch 75 shown schematically in FIG. 3, controls a conventional display light 57. In the example described, display light 57 is a single digit numerical display light which is sold by the Allard Co. The display light 57 has seven elements arranged in the shape of the number 8. Any one of the ten decimal digits can be displayed by illuminating appropriate groups of these seven elements. For example, the number zero is displayed when the six peripheral elements are illuminated, and the number eight is displayed when all seven elements are illuminated.

A receiver box 58 is joined to the head box 55 on a side panel 59 thereof which extends vertically above the tray 56. A female electrical connector 60 is mounted in the receiver box 58 above a hole in the bottom thereof. Wires connected to the pins of the connector 60 extend through an entry hole, not shown, in the side panel 59 for connection to components located in the head box 55.

In FIG. 3, the components which are located within the head box 55 and which are pertinent to an understanding of the present invention are shown within block 55.

A DC power supply shown as a block 61 receives 110 volt AC power and has a +V output line and a 0V line. In the example described, power supply 61 produces 24 volt DC power so as to be compatible with commercially available relay components. Conduit indicated at 52 in FIG. 2 is provided for the wires interconnecting the head box 55 and the dispensing unit 20.

A credit display shown as block 62 includes the numerical display light 57. The Allard Co. sells a commercial credit display that includes the display light 57 and a diode matrix (not shown) which connects a 24 volt signal from any one of 10 input lines to any one of 7 lines (not shown) so as to energize the display light 57 for displaying any selected one of 10 digits.

The relay components in the head box 55 which are pertinent to an understanding of the present invention are each shown schematically within a dashed block. Each relay includes a coil and sets of relay switch contacts. In FIG. 3, the relay contacts are shown in their normally open position wherein a movable arm is electrically connected to an associated normally closed contact. For each relay, when the relay coil is energized, each of its movable arms moves so as to break the electrical connection with the normally closed contact associated therewith and to make electrical connection with a normally open contact associated therewith.

FIG. 3 also shows schematically the components within transmitting unit 5 and the electrical circuit paths that are completed when its electrical connector 7 is inserted into the female electrical connector 60 in the receiver box.

As shown, an electrical circuit path from the +V line through a coil 64 of a safety relay (SAF) is completed to the 0V line when the transmitting unit 5 is connected in. The completion of this electrical circuit path energizes the safety relay and electrically connects arm 65 and normally open contact 66. Arm 65 is connected to the +V line and the contact 66 is connected through the connector 7 and receptacle 60 to one end of a resistor 67 in the transmitter 5. The other end of the resistor 67 is connected to the normally open contact of the push-button switch 6. The arm of the push-button switch 6 is connected to a capacitor 68 in a series-circuit path to the 0V line which is completed when the transmitting unit is connected in. After the transmitting unit 5 is connected in, the capacitor 68 is charged to +V each time the push-button is depressed. The normally closed contact of the push-button switch 6 is connected to a coil 70 of an ADR relay when the transmitting unit 5 is connected in. The charge stored by capacitor 68 after the push-button is depressed is discharged through the coil 70 when the push-button is released.

Thus the ADR relay is momentarily energized each time the push-button is operated while the transmitter is connected in. In response, an arm 71 makes electrical connection with a normally open contact 72 to complete a circuit path between the +V line and the meter 73 in the transmitting unit 5 and a separate accumulating meter 74 in the head box 55. The meter 73 provides a record of the number of credits attributable to the individual transmitting unit irrespective of which dispensing unit 10 accepted those credits whereas the meter 74 provides a record of the number of credits accepted by the individual dispensing unit 10 irrespective of which transmitting unit 5 inserted those credits.

A conventional stepping switch 75 is provided to register credits entered into the dispensing unit 10. The stepping switch 75 includes a wiper arm 76 which is rotatable to make electrical connection with any one of a plurality of contacts. In the example described, the stepping switch has 10 contacts individually connected to the credit display 62 and a wiper arm connected to the +V line. FIG. 3 shows the wiper arm in a zero position wherein the display light 57 in the credit display 62 displays the number zero. The stepping switch 75 also includes coils 78 and 79 which are individually energizable by the 100V AC line. Each time the coil 78 is energized by a credit signal applied thereto from the contact 83 of the ADR relay the wiper arm 76 rotates in one direction to break connection with one contact

and to make connection with an adjacent contact on one side and the display light 57 then displays an incrementally larger number. Each time the coil 79 is energized, the wiper arm 78 rotates in the same manner but in the opposite direction and the display light 57 then displays an incrementally smaller number. Thus the coil 78 is energized to add credits and the coil 79 is energized to subtract credits.

The circuit path for energizing the coil 78 includes the 100V AC line; an arm 80 and normally open contact 81 of the SAF relay, an arm 82 and associated normally open contact 83 of the ADR relay, the coil 78 and the 100V neutral line. Thus with the transmitting unit 5 connected in and the safety relay energized thereby, for each time the pushbutton switch 6 is depressed and then released, a credit is added in.

A cam 76' is mounted in a conventional manner for rotation with the wiper arm 76 of the stepping switch 75. A microswitch 85 operated by the cam 76' is open only while the wiper arm 76 is in the zero position and is closed when the wiper arm 76 is not in the zero position.

A coil 84 of a cash sale relay CSR is connected in series with the switch 85 and is energized by the +V line while the switch 85 is closed. Thus the cash sale relay is not energized whenever the stepping switch 75 is in the zero position. For any given sales operation the stepping switch 75 is in the zero position before any credits have been added in and also, as will be explained in more detail, during the dispensing of the gasoline corresponding to the last credit.

Before the gasoline is actually dispensed the reset lever 42 (FIG. 2) is rotated to reset the dispensing unit 10 to the zero position and then the control handle 44 (FIG. 2) is rotated. The rotation of the control handle causes a pump control switch PCS in the switch box 47 to close. A pump control relay PCR has a coil 86 in series with the +V line, the switch PCS and the 0V line and PCR is energized while the switch PCS is closed. An arm 87 of the PCR relay is connected to a 220V AC line, and when the PCR relay is energized applies 220V AC to an associated normally open contact 88 which is connected to the remote pump 24 by the lines 25 (FIG. 2).

Consider now the circuitry associated with the operation of the valve assembly 26.

The FFV valve is turned on when either of two circuit paths are closed. The first circuit path includes the 110V AC line, an arm 89 and associated normally open contact of the PCR relay, and an arm 90 and associated normally open contact of the CSR relay. This first circuit path is closed after at least one credit has been added in, so as to energize the CSR relay and the control handle 44 has been rotated so as to actuate switch PCS and energize the PCR relay. Owing to the de-energization of the CSR relay, this first circuit path opens again during the dispensing of the gasoline corresponding to the last credit. The second circuit path includes the 110V AC line, an arm 91 and normally open contact 92 of a zero position relay (ZPR), a normally open contact 93 and an arm 94 of a slow flow relay (SFR). This second circuit path provides a carry-over whereby the FFV valve is energized and as a result held open for the first portion of the dispensing of the gasoline corresponding to the last credit.

The SFV is turned on when the ZPR relay is energized to close a circuit path including the 110V AC

line, the arm 91 and normally open contact 92 of the ZPR relay, and the neutral line.

The ZPR relay is controlled by the cam operated zero position switch ZPS in the box 50. The switch ZPS is connected in series with the coil 95 of the ZPR relay which is energized by the +V line while the switch ZPS is closed. As pointed out above, the switch ZPS is open whenever the zero position cam is between its zero position and its subtract position, and the angular distance between these two positions corresponds to approximately 3 cents worth of gasoline. Thus in each sale, during the dispensing of the first 3 cents worth of gasoline the switch ZPS is open and ZPR relay is not energized. While the ZPR relay is unenergized, a circuit path is closed which includes the +V line, a resistor 96, a normally closed contact 97 and arm 98 of the ZPR relay, a capacitor 99 and the 0V line. A charge is stored by capacitor 99 by virtue of this circuit path. After approximately 3 cents worth of gasoline is dispensed and the zero position cam reaches its subtract position, the ZPS closes and energizes the ZPR relay. In response, the arm 98 and associated normally open contact 100 of the ZPR relay make electrical connection. A coil 101 of a subtract relay (SUB) connected between the normally open contact 100 and the 0V line is momentarily energized by the discharging of the capacitor 99.

An arm 102 and normally open contact 103 of the SUB relay make electrical connection while the SUB relay is momentarily energized and complete a circuit path from the 110V AC line through the coil 79 of the stepping switch 75. As pointed out above, energization of the coil 79 causes the stepping switch to rotate one position in a direction to subtract credits. If, for example, three \$1.00 credits were added into the system, the three credits would be subtracted one-by-one after dispensing \$0.03, \$1.03, and \$2.03 worth of gasoline respectively. Thus the wiper arm 76 is returned to its zero position where it remains for the last \$0.97 worth of gasoline to be dispensed.

During the dispensing of this last \$0.97 worth of gasoline, the first circuit path for energizing the FFV valve is open. However, for a carry over portion the second circuit path therefor continues to energize the FFV valve. At the end of this carry over portion, the cam-operated slow flow switch SFW included in the box 50 is closed. In response, the SFR relay is energized and the FFV is turned off.

On the other hand, the SFV valve continues to be energized until the customer has received the last penny's worth of gasoline. Eventually, when the customer has received all the gasoline he is entitled to, the return of the zero position cam to its zero position results in the de-energization of the ZPR relay and the de-energization of the SFV valve.

Various modifications of the above-described embodiment are within the scope of the present invention. For example, a push-button switch can be mounted on each dispensing unit instead of in each transmitter unit. As another example, the relay circuits can be replaced by substantially equivalent but generally more expensive logic circuits using transistor gates and the like.

I claim:

1. In a service-attendant controlled system for dispensing fluid having a monetary value, which includes a stationary dispensing unit comprising controllable means for dispensing the fluid and fluid-flow metering and computing means for computing separately for

each transaction with a customer the monetary value of fluid as it is dispensed, the combination comprising:

- a portable unit hand-carriable by the service attendant to and from the stationary dispensing unit, the portable unit including a multi-pin electrical connector;
 - a receptacle on the dispensing unit for connection to the multi-pin electrical connector;
 - an electric circuit path being closed only while the multi-pin electrical connector and the receptacle are interconnected;
 - input signaling means for generating input credit signals representative of monetary value, the input signaling means including said electric circuit path and a switch hand-operable by the service attendant while adjacent the stationary dispensing unit; means operable while said electrical circuit path is open for controlling said controllable means so that the monetary value of the fluid dispensed does not substantially exceed the monetary value represented by the generated input credit signals, whereby the service attendant can meet the customer at the dispensing unit, initiate the operation of the system, and then leave and allow the customer to complete a transaction;
 - accumulating indicator means in the portable unit for accumulating and indicating a cumulative value of input credit signals generated while the multi-pin electrical connector and the receptacle are interconnected;
 - a coin storage in the stationary dispensing unit; means for stopping the dispensing of fluid before its monetary value equals the monetary value represented by the generated input credit signals; and means for paying change from the coin storage.
2. Apparatus according to claim 1 further comprising numerical display means responsive to the generated input credit signals for displaying the monetary value of the input credit signals generated while the multi-pin electrical connector and the receptacle are interconnected.

nected.

3. Apparatus according to claim 2 further comprising register means for storing incremental values to be displayed by the display means, the register means being incremented in response to the input credit signals and being decremented in response to the dispensing of fluid.

4. In a fluid-dispensing system which includes a plurality of independently operable dispensing units each comprising counting means, a stationary connector part coupled to the counting means, fluid-flow metering means, and means operable for dispensing fluid up to an amount determined by the metering and counting means, and which further includes a portable unit having a mating connector part connectable to any one of the stationary connector parts, and means manually actuable to increment the counting means in a dispensing unit while its stationary connector part is connected to the mating connector; a method comprising the steps of

1. connecting the mating connector part to a selected one of the stationary connectors;
2. actuating the manually actuable means a desired number of times to increment to a preselected input number the counting means coupled to the selected one of the stationary connector parts;
3. disconnecting the mating connector part from the selected one of the stationary connector parts and thereby preventing further actuation of the manually actuable means from incrementing further the counting means coupled to that stationary connector part;
4. operating the means for dispensing fluid in the dispensing unit having the first selected stationary connector part;
5. carrying the portable unit to a different selected one of the stationary connector parts and repeating there steps 1 through 4.

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